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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/630,228	08/01/2000	David Alan Burton	TUC920000013US1	6085

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EXAMINER

ANDERSON, MATTHEW D

ART UNIT	PAPER NUMBER
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2186

DATE MAILED: 02/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/630,228

Applicant(s)

BURTON ET AL.

Examiner

Matthew D. Anderson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-51 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,15,16,30,31,42,43 and 47-51 is/are rejected.
- 7) ☒ Claim(s) 2-14,17-29,32-41 and 44-48 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 August 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In response to the amendment filed 1/27/04:
claims 7, 16, 26-29, 31-48 have been amended;
new claims 49-51 have been added.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
3. Claim 47 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
4. Claim 47 recites the limitation "the cache control blocks" in lines 9-10. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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6. Claims 1-2, 15-16, 30-31, and 42-43 are rejected under 35 U.S.C. 102(b) as being anticipated by Cheong *et al.* (US Patent # 5,533,189).

7. With respect to claims 1, 16, 31, and 43, Cheong *et al.* disclose:

receiving an update to one or more blocks of customer data at addresses in the storage device, as recited in column 5, line 50, and column 6, lines 55-60;

for each block of data to update, generating metadata indicating the address of the block in the storage device and an error checking code that is capable of being used to determine whether the customer data in the block has changed, by teaching in column 1, lines 15-20, that each entry contains an address and tag portion including a dirty bit, and in column 5, lines 60-65, of generating an ECC based on the tag bits;

for each block of data to update, writing the block of data to update and the metadata for the block to cache; and for each block of data to update, transferring the block of data and the metadata for the block from the cache to the storage device, by teaching in column 1, lines 30-50, of writing to higher and lower levels of the memory hierarchy.

8. With respect to claims 15, 30, and 42, Cheong *et al.* disclose the error checking code being further capable of being used to determine whether the metadata in the block has changed, as recited in column 1, line 60 through column 2, line 5.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 47-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheong *et al.* and DeKoning *et al.* (US Patent # 5,761,705).

11. With respect to claims 47-51, Cheong *et al.* teach all other features of the claims, as discussed above in the other independent claims, but fail to specifically disclose the blocks of data and metadata being stored in a nonvolatile portion of the cache and cache control blocks being stored in the volatile portion of the cache. DeKoning *et al.* teach in column 8, lines 13-18, that the actual cached data and smaller control blocks (metadata) are stored in the non-volatile portion of the cache memory subsystem, and the recovery control blocks are used to recover the cache control blocks (CCBs) in the volatile portion of the cache memory subsystem.

12. It would have been obvious to one of ordinary skill in the art, having the teachings of Cheong *et al.* and DeKoning *et al.* before him at the time the invention was made, to modify the hierarchical cache recovery system taught by Cheong *et al.*, to include a cache with volatile and nonvolatile portions, as with the hierarchical cache recovery system of DeKoning *et al.*, in order to recover data in a redundant system, as taught by DeKoning *et al.*.

Allowable Subject Matter

13. Claims 2-14, 17-29, 32-41, and 44-48 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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14. The following is a statement of reasons for the indication of allowable subject matter: the prior art does not teach or suggest the combination of claim elements specifically including the following:

[Claims 2, 17, 32]: for each block of data to update, performing an operation on the customer data in the block and the error checking code to determine whether the customer data has changed, wherein the block of data to update and metadata for the block is transferred to the storage device if the address of the block in the metadata and requested address match and the customer data has not changed.

[Claims 4, 19, 34, 44, and 46]: setting up a control block including the address of a first block of data to update in the storage device and an instruction to generate the address and error code as metadata for the block, wherein generating the metadata indicating the address of the block in the storage device comprises using the block address in the control block as the address of the block in the storage device to write as metadata.

[Claims 6, 21, and 36]: XOR'ing the customer data, not the metadata as in Cheong.

[Claims 10, 25, and 40]: recovering from a power loss, and using the metadata for blocks in cache to rebuild cache control blocks for the blocks in cache after recovering from the power loss.

[Claim 48]: a first data structure indicating whether each block of data in cache is valid or invalid and a second data structure indicating whether each block of data includes modified or unmodified data, wherein the error checking code is used to determine whether each block of data in the cache has changed in the event of a data recovery event, wherein the first data

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structure is modified to indicate that a block of data is invalid if the second data structure indicates that the block of data is not modified and the block of data has changed.

Response to Arguments

15. Applicant's arguments filed 1/27/04 have been fully considered but they are not persuasive.

16. With respect to claim 1, the Applicant alleges that the address of the block of the storage device is different than a cache address because the storage device is the device that is updated, which is separate from the claimed cache. Cheong teaches in column 1, lines 15-20, that the address tag of the directory entry is the tag portion of the address of the data entry in the lowest level of the memory hierarchy. Therefore, a cache update request resulting in an index to the cache directory would indicate the address in the system memory (lowest level) to update, satisfying the first limitation of claim 1. For the third limitation, the cache data entry is updated, as previously discussed in columns 5 and 6. As for the third limitation, Cheong discusses in column 1, lines 25-50, of writing back a modified cache entry to system memory (lower level) to maintain coherency.

17. With respect to claim 1, the Applicant alleges that Cheong does not disclose the metadata including an ECC to determine whether the customer data has changed. The tag and status bits previously discussed indicated if the data entry has been modified. Is the Applicant referring more to the fact that the data is "customer" data? What makes the data "customer" data? If a person, or customer, who uses Cheong's system and data, would that not make the data customer data? Perhaps a more detailed description of what is included in the customer data is in order.

Conclusion

18. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

19. The prior art made of record on form PTO-892 and not relied upon is considered pertinent to applicant's disclosure. Applicant is required under 37 C.F.R. § 1.111(c) to consider these references fully when responding to this action. The documents cited therein teach similar error correction systems.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew D. Anderson whose telephone number is (703) 306-5931. The examiner can normally be reached on Monday-Friday, 2nd Fridays off.


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Kim can be reached on (703) 305-3821. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.



Matthew D. Anderson
February 12, 2004



MATTHEW KIM
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